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FOREST SERVICE

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# BRANCH OF RESEARCH

## MONTHLY REPORT

OF

FOREST EXPERIMENT STATIONS

FOREST PRODUCTS

FOREST ECONOMICS

RANGE RESEARCH

MAY 1932







## BRANCH OF RESEARCH

May, 1932

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## BRANCH OF RESEARCH

May, 1932





## FOREWORD

### SCIENTIFIC WRITINGS AS LITERATURE

(Daily Digest, May 27, 1932)

Nature (London) for May 14 says: "We should, in fact, be inclined to lay the greater stress on Huxley's native taste and effort and on the favorable circumstances of his writings, and less on the detailed features which Aldous Huxley discovers -- the balance of phrases, the caesura ending, the Biblical allusions, and so forth. These are by the way. The main thing was having clear ideas and trying always to say them in the fewest and most appropriate words. The true man of science has in this respect an initial advantage over other writers, because he starts with a definite statement about something observed which he wishes to convey to his readers in the most direct and effective way. German writers do not conform to the rule owing to the complication of their tongue; but recently some professors of English in an American university compiled an anthology of extracts from the writings of men of science as a textbook for students in English. Plenty of names will occur to one at once of scientific writers who might be named in the same class as Huxley, though none perhaps so racy and pointed. His own contemporary Tyndall was one of the best. It should also be remembered that these men were living and writing at a time when a great new idea was in the air and inspiring both those who promoted it and those who were on the defensive to special mental gymnastics. No one can read Huxley without enjoying the bracing atmosphere of controversy in which he worked. He was always stripped and putting the last ounce into his fencing. For this both he and we have largely to thank the doctrine of evolution. We are not so controversial at the present day, or at any rate our controversies have not the same all-pervading and stimulating effect."

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(Over)



## ALLEGHENY FOREST EXPERIMENT STATION

### Management

Hough began work on his formal paper covering the virgin timber on East Tionesta Creek. Forbes completed the large task of summarizing on convenient cards all pertinent data obtained in the 1929 extensive surveys; the form which the final report on these surveys should take is slowly becoming clearer.

Wood has been pushed to keep up his measurements on the oak seedlings which have germinated all month at Camp Ockanickon and in the greenhouse in Philadelphia. He has installed his four new rain gauges under different degrees of cover at Camp Ockanickon, and has continued his measurements of soil moisture on a considerable scale.

### Mensuration

Schnur is well under way with his article on diameter distribution of loblolly pine, and is pushing the mortality study. A comparison of the height curves for one of the loblolly plots which has been re-measured four times, brings out very clearly the necessity for revising the height curve for an even-aged stand at frequent intervals. To illustrate: a four-inch tree in a ten-year old stand was  $22\frac{1}{2}$  feet high; a four-inch tree in the same stand at 15 years of age was 30 feet tall; at 20 years, 32.5 feet; at 25 years, 41.0; and at 30 years, 43.5 feet.

### Mycorrhiza

Hatch has prepared the first draft of an article entitled "The term mycorrhiza applied to the roots of Pinus", in which are embodied some of the results of his Swedish work. He has about completed the sectioning of seedlings grown in pure culture in Sweden. His resignation from the staff, to undertake graduate work at Harvard, will be effective early in June.

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## APPALACHIAN FOREST EXPERIMENT STATION

### Forest management in North Georgia

Barrett continued the collection of data on the growth rate of white pine and associated species. The work was carried from the region around Blairsville, Ga., up into southwestern North Carolina. Here several stands of white pine were visited which had been recently thinned by the Nantahala National Forest. Due to the resort development near Highlands, there is a good demand for house poles. The National Forest has taken advantage of this situation and is thinning the more accessible white pine stands. Single trees sell for 35 to 50 cents each.



A preliminary set of site index curves for white pine has been prepared. When further data are collected these curves will be developed for use in the Southern Appalachians.

### Loblolly Pine

MacKinney continued his analysis of data on increased growth and change in form of loblolly pine trees left following partial cutting. The main results of the work were to throw doubt on the conclusions reached previously concerning the changes in form. The data will be analyzed further in hope of uncovering some hitherto unconsidered factor or factors.

### Fire-weather

Pierce has completed the organization of part of the reporting network for the fire-weather warning service. Station sites and observers have been selected in the region of the Cherokee and Pisgah National Forests and negotiations are now in progress for observers in other parts of the area to be covered.

Instruction manuals for observers have been completed and are now ready for distribution. Instrumental equipment has been received.

### Streamflow and erosion

Hursh made an observation survey of suitable areas for detailed study of run-off. The remainder of the month was spent at the Bent Creek experimental forest in field study of humus types and in completion of preliminary tests of apparatus for observing direct run-off.

The intensive field study of direct run-off will begin as soon as the required recording instruments are obtained. This study will begin with the important condition classes within the forest types at the Bent Creek forest.

### Fire studies at Bent Creek

An area of approximately 30 acres has been selected on the Bent Creek forest for the study of the effect of fire on Appalachian Mountain hardwoods. Approximately 20 acres will be burned the coming fall or spring and about 7 have been reserved as a check area. Because of differences in composition and stocking, and expected differences in severity of burning, the experimental plots have been divided checkerboard fashion into tenth-acre units. A grouping of similar units and a comparison of various groupings can thus be made. On the plot to be burned, the descriptions will be made only on alternate tenth-acre units. The area is located on a slope and is sufficiently large so that a burn comparable to a natural uncontrolled burn is expected. Some of the effects of fire to be observed in the experiment are: reduction of basal area, continued tree mortality, rate of growth of injured trees, damage to reproduction,



possible changes in composition, and deposition and accumulation of leaf litter.

Burleigh, of the Biological Survey, will conduct a study of the effect of fire on rodent population of the experimental areas.

### Biological Survey

With the exception of a few days spent in general routine work at Asheville, the month was devoted to a detailed biological survey of the coast region of North Carolina and South Carolina, in company with A. H. Howell, Senior Biologist of the Bureau. Starting near Norfolk, Va., numerous stops were made at various points along the coast as far south as Charleston, S. C., detailed records being kept of all birds and mammals noted, and many specimens collected of taxonomic interest. The northern and southern limits of many species of birds and mammals occurring in this region have for many years been rather imperfectly known, and this fact was given due consideration during the course of this field work. Many facts brought out pertaining to distribution indicated a need for a more careful ecological study of this region at a later date.

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## CALIFORNIA FOREST EXPERIMENT STATION

### Forest Management - Pine Region

Seasonal growth and instrument records were resumed at Stanislaus Branch May 1. An extremely heavy snow-pack last winter caused damage to set-up enclosures, to screen frames and other equipment. The greatest depth of snow on the ground at one time was about  $10\frac{1}{2}$  feet.

Evidence of the hard winter is seen in the intensified damage by non-hibernating rodents. The search for food was apparently conducted with microscopic thoroughness. Largely for this reason the heavy crop of sugar pine seedlings, hopefully predicted last winter, has not materialized. Many established seedlings four or five feet high were "eaten alive" by pocket gophers. The importance of rodents in relation to sugar pine reproduction becomes ever more apparent.

The mechanical difficulties of excluding rodents from participating in his experiments led Dunning to search despairingly for an effective repellent. Consulting Biologist Horn recommended naphthaline moth balls. Six spots were seeded with sugar pine seed. In three of the spots moth balls were mingled with the seeds. It is seldom that the experimenter is favored with such quick and positive results. Two hours after starting this experiment the results were ready for publication. The data were thoroughly analyzed and the bad ones rejected. Even the moth balls were worn with handling, not to say tooth-marked.



## Forest Management - Redwood Region

Person, Hallin, and Stahelin studied the condition of cut-over redwood areas. On one area, cut between 1924 and 1927 and burned in September 1931, it was found that a very high percentage of the redwood planted trees sprouted after the fire except in cases where the fire was so hot that all evidence of the tree was destroyed.

In another case, strips were run to determine the effect of seed trees. The diameter, height, and tree class of all "leave" trees were recorded on strips four chains in width which were run at right angles to cutting edges. The regular milacre quadrat transect strips were run through the center of the seed tree strips. Although great differences in the amount of reproduction were found it is again evident here that under favorable conditions redwood will reproduce naturally from seed.

## Range Research

Talbot and Doctor Sampson also attended a meeting of the range committee of Tehama County and adjoining localities. This meeting was an outgrowth of the big "burning" meeting in February, attended by forest officers, stockmen, lumbermen, and other representatives of important land uses. The committee met to consider ways and means to improve grazing conditions on many national forest ranges, and adjoining foothills, where grazing capacity is said to have been greatly reduced by the steady encroachment of brush. The committee reflected the conviction of a heavy majority of stockmen in that region, that benefits would result from burning many brushy areas. Recent trends of his experiments on fire and forage were explained by Doctor Sampson, proposed range studies were outlined by Talbot, and the State viewpoint on fire suppression was explained by officials of the State Division of Forestry. In spite of these explanations strong criticism of the Forest Service fire exclusion policy was voiced. A rather serious situation exists in this region, where the majority of stockmen, now in critical economic straits, believe in the burning of mountain grazing lands. Final action resulting from the meeting has not been completed.

Hormay assisted Persons in the field identification of grasses. A simplified key to grass tribes of the redwood region was prepared. Cut-over redwood lands support an abundance of annual grasses which apparently have come in following cutting of the timber.

An examination of the temporary foothill plots, possibly the last systematic one, was made by Renner and Hormay. Annual vegetation on the plots was found to be almost completely dry, with the exception of species of Hemizonia and Navarretia, glutinous drought-resistant plants of late development and practically no forage value. These temporary plots have proved very much worth while as aids to the obtaining quickly of a general knowledge of the principal forage zones in the Sierra Nevada foothills.

## Erosion and Streamflow

### Triplicate Watershed Study

As a result of a diligent search in southern California, three similar watersheds have been selected, subject to more intensive examination, for the scene of our large-scale studies of the influence of chaparral on water conservation and yield. The experience with the plot installations indicates the desirability of having represented three conditions. They are:

1. Natural undisturbed cover.
2. Cover removed, and vegetation permitted to return naturally under normal responses.
3. Cover removed and surface maintained in a denuded or disturbed condition throughout the life of the experiment.

A few limiting conditions surround the selection of the watersheds in question and require slight modifications in the original tentative working plan. The present location, however, involves the minimum of limitations thus far encountered. The two most important limitations are:

1. Size of watershed which can be safely burned off under control.
2. Watersheds of intermittent flow.

A size of watershed for which the responsibility to burn can be safely assumed is so small that the flow in the drainage channel is only intermittent under the climatic conditions of southern California, where the summers are dry. Accordingly, two types of watersheds must be selected for study, with different management: first, the smaller watersheds of intermittent flow on which cover may be burned under control; second, larger units with perennial flow, for control and for determination of run-off coefficients. If in time one or more of the larger units is burned over by an accidental fire the scene will be set for comparisons on a larger scale.

The areas of the two types of watersheds for study have been determined from maps to be as follows:

#### Watersheds of intermittent flow:

|       |               |
|-------|---------------|
| No. 1 | 39.3 acres    |
| " 2   | 43.7 "        |
| " 3   | 72.5 "        |
|       | <hr/> 155.5 " |



## Watersheds of perennial flow:

|               |      |       |
|---------------|------|-------|
| Compartment A | 1621 | acres |
| " B           | 1281 | "     |
| " C           | 1495 | "     |

It is proposed to measure streamflow only from the compartments A, B, and C, but both streamflow and eroded material would be measured from watersheds 1, 2, and 3.

San Dimas Canyon, in which these areas are located, has an area of approximately 10,000 acres above the flood control dam. The eroded material from the entire watershed is to be measured in this reservoir as an outside check.

### Tipping Bucket Tests

The 0.5 cubic foot run-off tipping bucket was subjected to test for a period of 8 days of continuous operation in measuring a streamflow of 0.3 second feet flow in the Y watershed, Devil Canyon. It was found that the tipping bucket averaged 0.6 cubic feet at each tip during this period. The test indicated slight revisions in design, which were made and included in the specifications. Improved instruments have been ordered for the California Station, and at the same time for the Intermountain and Southwestern stations.

The most important new feature of the test was the adding of sand to the flume leading into the tipping bucket hopper, so that the movement of bed load material down a stream was simulated. In every case the instrument cleaned itself satisfactorily. The device appears, therefore, adapted to the measurement of intermittent flow producing accelerated erosion from experimental areas. Further tests are planned to determine the difference in readings caused by the movement of different amounts of bed load material in a stream.

### Fire Research

#### Forest Fire Control Indexes

The need has often been expressed for a method of computing the relative severity of each fire season as a whole, - an index figure which will show the variation from some fixed base. Such an index would permit sound comparisons between years, forests, or Regions.

The severity of the fire season is the final result of number of fires starting, amount of labor necessary to suppress fires, money spent on suppression, acreage burned, and damage resulting. In the last analysis the criterion of the most severe fire season is a combination of large number of fires, large amounts of line to construct, large fires burning a large acreage, resulting in a great damage and costing a large amount of money. On the other hand, an easy fire season means few fires, controlled with a minimum of line construction, small acreage, resulting in little damage and costing a small amount of money.

It is important that we know how much each of the above items contributes to the severity of the fire season. A single index would not give this information; therefore, after some experiment it was considered more useful to have an index for each of the individual items.

A "normal" fire season is indeterminate, for although it may be "normal" in several of the factors influencing the severity of the fire season, it may be distinctly abnormal in the remaining factors. For this reason the average of each of the factors, for the past ten years, was taken to represent the base, or normal season.

As an approach to this problem a set of indexes was worked up for the Shasta National Forest for the 10-year period 1921-1930.

Table I. - Indexes of Forest Fire Control  
Shasta National Forest

| Year           | No. of<br>Fires | Area<br>Burned | Volume<br>of Work | Cost of Fire:<br>Fighting | Damage     |
|----------------|-----------------|----------------|-------------------|---------------------------|------------|
| 1921           | 79              | 74             | 60                | 13                        | 105        |
| 1922           | 62              | 90             | 93                | 66                        | 117        |
| 1923           | 66              | 55             | 43                | 12                        | 8          |
| 1924           | 124             | 289            | 188               | 183                       | 234        |
| 1925           | 132             | 7              | 59                | 22                        | 5          |
| 1926           | 141             | 288            | 184               | 219                       | 356        |
| 1927           | 109             | 24             | 73                | 92                        | 14         |
| 1928           | 115             | 146            | 112               | 274                       | 125        |
| 1929           | 83              | 21             | 61                | 52                        | 19         |
| 1930           | 87              | 4              | 63                | 67                        | 17         |
|                | (232)           | (25,669)       | (1569)            | (\$45,663)                | (\$15,331) |
| Ave., 1921-30* | 100             | 100            | 100               | 100                       | 100        |
| 1931           | 109             | 40             | 95                | 130                       | 36         |

\*The figures in parentheses are the absolute figures upon which the relatives are based.



To illustrate the method of construction, the details of formulating the number of fires index is illustrated below:

Table II. - Shasta National Forest

| <u>Year</u> | <u>No. of Fires</u> | <u>Index</u> |
|-------------|---------------------|--------------|
| 1921        | 183                 | 79           |
| 1922        | 145                 | 62           |
| 1923        | 154                 | 66           |
| 1924        | 287                 | 124          |
| 1925        | 306                 | 132          |
| 1926        | 327                 | 141          |
| 1927        | 253                 | 109          |
| 1928        | 267                 | 115          |
| 1929        | 193                 | 83           |
| 1930        | <u>201</u>          | <u>87</u>    |
| Total       | 2316                |              |
| Ave.        | 232                 | 100          |
| 1931        | 252                 | 109          |

The procedure consists of adding the total number of fires for each year and obtaining the average for the decade. Then each index is the ratio of the number of fires in that year to the average number over the period. The index for 1931 is computed on the same base as the other years. The other indexes shown in Table I, with the exception of the volume of work index were formed in the same manner. The damage index is formed from damage estimates on fires within the National Forest boundaries only, while other indexes include all fires within the protected areas. Damage figures on fires outside of the National Forest boundaries were not available for all years of the decade.

The volume of work or "fire business" index is a weighted index, formed as follows:

All fires were first classified according to the following arbitrary size classes: A, B, 10-59, 60-299, 300-599, 600-999, 1000-2499, 2500-4999, and over 5000 acres. Then the perimeters of fires of all sizes from 1/4-20,000 acres were plotted for several years, and a curve drawn showing the average perimeter of fires of each size class. The average perimeter of the mid-point of the above area classes was then used as a basis for weighting. To facilitate computations, the average perimeter was divided by ten and the resulting figure used as a weight.

The next step consisted of multiplying the number of fires in each area class for each year by the average perimeter of that class. For the fires in the A classification, a weight of 1 was chosen, as against 5 for the B fires. This results in overweighting the A fires on a perimeter basis, but was considered logical because the amount of work required to

suppress an A fire is not so closely dependent on perimeter as in the case of larger fires.

All fires over 5000 acres were weighted by the perimeter of a 5000 acre fire. This was done to eliminate the effect of large fires which became large because of human failures as well as by extreme weather conditions.

The weights used were as follows: A-1, B-5, 10-59 acres-11, 60-299 acres-25, 300-599 acres-46, 600-999 acres-48, 1000-2499 acres-75, 2500-4999 acres-100, 5000 acres and over-120.

After all fires in the various area classes had been weighted for each year, an annual total was made. This total was considered an expression of the amount of fire suppression work required in that year. To place these values on a comparable basis with other indexes they were expressed as relatives.

The indexes offer some interesting comparisons of relationship. For instance, the volume of work index is practically identical for the years 1921, 1929, and 1930. Both area burned and cost have varied greatly during the same period. The cost of fire fighting was 5 times as great in 1929 as in 1921, while the area burned was only one-fourth of that of 1921. This gives some indication of the increase in efficiency which has accompanied increase in suppression expenditures.

Indexes of this type constructed for comparable units, such as all the national forests within a Region or for all Regions in the United States might form the basis of some interesting comparison on growth and efficiency.

## Products

### Logging and Milling Study

Cutting all trees 12" D.B.H. and over on the Stanislaus study area yielded 53,192 bd. ft. net scale per acre. The fixed acre cost for railroad spurs, camps, etc., amounting to \$84.64 an acre, was, therefore, \$1.59 per M.B.M. when spread over this volume. Cutting to a 30" D.B.H. limit, i.e., leaving all trees 29" and smaller, yielded a cut of 45,601 bd. ft. per acre, raising the fixed acre cost to \$1.86 per M.B.M. BUT, - all other operating costs, from felling the trees to loading the lumber on the car, came to \$20.03 per M.B.M. for the 12" limit and dropped to \$18.87 for the 30" limit, due, of course, to the leaving of 7,591 bd. ft. per acre in the smaller, higher-operating-cost sizes. Total costs per M.B.M. net scale were thus \$21.62 for the 12" limit and \$20.73 for the 30" limit, a saving of \$.89 per M.B.M.

The mill run value of all trees 12" D.B.H. and over was \$30.98 per M.B.M. net scale. Without the 12" to 29" trees included, the mill run value was raised to \$32.39, an increased realization of \$1.41 per M.



The cost saving of \$.89 added to the increase in value of \$1.41 gives the very substantial sum of \$2.30 per M.B.M., which may be interpreted either as the penalty paid by the operator for cutting trees from 29" down to 12" D.B.H., or as a reward for leaving trees of these sizes, on site 1 areas in the Western Sierra region.

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## CENTRAL STATES FOREST EXPERIMENT STATION

### General

Ohio State University has allotted the Station approximately one thousand square feet of additional office space in Room 208, Horticulture and Forestry Building, adjacent to the present offices in Room 209. The new quarters will be available on June 15, and will relieve the present extremely crowded conditions which have endured for some time. This action on the part of the University results in a most satisfactory arrangement, and is very much appreciated.

The vacancy in the Senior Clerk position, caused by the resignation and marriage of Miss Ruth Ent early in April, has been filled by the transfer of Mr. Boyd Parker from the Apache National Forest in Arizona, on May 15. Mr. Parker has had five years' experience in Forest Service work in Region 3.

In cooperation with the Department of Forestry, Ohio State University, assistance was contributed by the Station in establishing plantation plots in the University woodlot.

### Black Locust Plantation Project

Field work in establishing yield plots of planted black locust was started in Indiana, where the 1931 work terminated. Dr. Hall also spent a few days with the party, to organize the procedure of collecting additional locust borer data. During May, 40 plantations were examined, in which 22 permanent yield plots and 9 sub-plots were established. Kuenzel established contacts with local editors in the towns visited, as a result of which there appeared a number of articles in local papers.

During the course of the work, several very rapidly growing black locust plantations were observed. The trees in a 23-year old plantation in southern Franklin County averaged 55 feet in height, and were straight, free of limbs and defect of any kind. On a well-drained, silty clay-loam soil in northeastern Ripley County, the trees averaged 54 feet in height at 21 years of age. A 28-year old plantation in northeastern Jennings County averaged only 26 feet in height: the roots of the trees had been exposed by hogs, and there was a heavy infestation of locust borer.

As plots are established, observations are made regarding the apparent effect of various silvicultural measures, practiced by the plantation owners, upon the thrift and growth of the trees and locust borer control. Dr. Hall's observations that thrifty fast-growing trees are least damaged by borers, have so far been substantiated. The practice of cutting back young plantations badly damaged by borers, and reproducing the stand from fast-growing sprouts has been observed in several instances, and apparently helps to eliminate this pest. Several plantations were observed to have suffered severely from fire damage, and in each instance the stands showed more heart rot and borer damage than did similar unburned stands.

An abundance of black locust seed was observed in the litter and surface soil of plantations. In a Jennings County plantation, over 100 seeds were counted in the top inch of soil on an area of one square foot, yet only one locust seedling was observed in the entire plantation. Where brush piles had been burned within plantations, an abundance of seedlings were observed about the edges of the burned spot, indicating that this practice may favor seed germination.

#### Chestnut Blight

A survey by O. N. Liming, Pathologist of the Ohio Agricultural Experiment Station, in 1930 showed nine-tenths of the commercially important chestnut in Ohio to be 80 - 100 per cent infected by the blight. The western edge of the distribution of the tree in Ohio shows infection varying from 1 - 29 per cent. The blight has reached the western edge of the tree's range.

#### Woodland Grazing Project

##### Livestock Management Phase

Because of a very late season, the woodland carrying capacity study at the Pinney-Purdue Farm was not started until May 14. There was practically no vegetation in the woods on May first, the date the livestock were turned into the pasture last year. The animals provided this year by the Purdue Agricultural Experiment Station are all Angus and much more uniform in size than the Herfords used last year. Angus cattle are not as good rustlers as Herfords and they may not be able to utilize the coarse vegetation to the same extent that it was used last season.

Day visited the farm on May 27. The most striking observation was the sharp difference in the foliage production of the various species in the three different plots. In the eighteen acre tract all vegetation came out in full foliage, except black cherry which was the most seriously browsed species last year. Black cherry showed about 25 per cent reduction in foliage.

In the twelve acre tract black cherry, shagbark hickory, and blackberry all showed serious reduction in foliage. Much of the black cherry reproduction had not leaved out at all although the trees are still alive. The blackberry briars were noticeably thinner over the entire tract and the shagbark hickory did not have over 60 per cent of its normal foliage.



In the six acre tract the blackberries were completely dead in a number of large patches and showed no indication of sprouting up again. Over the entire tract there were approximately only 30 per cent as many green stems as there were last year. Black cherry and shagbark hickory appeared to be in about the same condition as was observed in the twelve acre tract.

Although the stock in none of the three tracts have done any material browsing as yet, it appears that complete utilization of the forage may occur at a considerable earlier date this season in both the six and twelve acre tracts.

#### Reconstruction Phase

The analysis of the permanent sample plot data during the past winter emphasized the need for annual remeasurements of reproduction on the plots which have just been released from grazing. Reexamination of several plots last season indicated that, on the areas severely damaged by past grazing, seedlings which are present one year may be entirely gone the following season, and an entirely new crop often of different species may have taken their place. In order to determine if possible just what these changes are, and the factors which cause them, a number of the plots have been selected for annual remeasurement and a few easily accessible plots will be examined throughout the growing season. Oliver Diller and William A. Medesy have been working under Day's supervision on this remeasurement work since May 24.

#### Locust Borer Investigation

During the early part of the month a spring spraying experiment was carried on in Jackson County, Ohio, for the control of the locust borer. Two spray materials, kerosene and orthodichlorobenzene was used by Dr. Hall in this experiment, duplicating the 1931 fall experiment in the same area. A summary of the results of both experiments follows:

| Spray Material | Fall               | Spring |
|----------------|--------------------|--------|
|                | Per cent effective |        |
| Ortho. Stock   | 78%                | 94%    |
| 3 to 1 Ortho.  | 48%                | 93%    |
| 6 to 1 Ortho.  | 43%                | 48%    |
| Pure Kerosene  | 99%                | 86%    |

In these experiments the sprayed trees were checked against control trees and the percentages given represent the effect of the sprays only and do not include the death of larvae due to various environmental factors. It was found on the control trees that over 85% of the young larvae, which hatched, had been killed by natural causes by May 16 at the time they were checked against the sprayed trees. It appeared at first

that part of this loss might have been due to the presence of a predator, but more detailed examination has not disclosed any insect or other animal in the act of destroying the larvae and there still remains some element of doubt on this point.

The Forest Service yield party, studying black locust, initiated its field season in southern Indiana on May 10. A few days were spent with this crew at the start coaching them in the collection of information on the locust borer on the plots which they establish.

A field trip was made with Mr. L. E. Sawyer, Extension Forester for Illinois, from May 12 to 14. Considerable territory was covered in south central Illinois examining stands of planted and natural black locust. Contacts were made with W. B. Flint, State Entomologist and R. B. Miller, State Forester, while in Illinois.

During the latter half of the month a number of selected sample plots, which were established during the past season, have been re-examined. Each tree on these plots has been carefully examined and the number of points of attack by the locust borer have been noted. These will be examined again in the fall and the number of fully developed larvae will be noted at that time. These examinations are for the purpose of determining the survival per cent of locust borer larvae in stands differing in age, amount of injury, and rate of growth. A total of 19 sample plots have been examined to date.

#### Black Walnut Growth and Yield

Kellogg returned to the Station on June 2, after having spent five months in the Washington office compiling volume and yield tables for planted black walnut.

The finally adopted treatment of the data in this project required separate correlations of total basal area, number of trees, and cubic foot volume per acre with age, site and original spacing (3' x 3' to 10' x 10') of plantations. These three basic studies were completed; tables were prepared and converted to graphic form. Tables were also prepared to show average basal area per tree, and average diameter at breast-height.

A study of "forest form factor" as a means of tying together the correlations of total basal area, number of trees and cubic foot volume, indicated a varying factor for each age and site index. For the poorest sites (40 feet) the values were found to increase rapidly with age. The better site qualities indicated a lower and more constant value for this factor, decreasing slightly with the improvement of the site. The forest form factor varied only slightly with spacing. No changes were made to force a single forest form factor for each age and site, because of the certain loss of balance in each of the basic correlations. A study was made to determine whether separate curves were needed for different spacings, to show the relation of board feet (International Rule) to cubic feet. There appeared to be a slight lowering of the ratio for very wide spacings, but it was so slight that a single curve based upon average



diameter was accepted as adequate for all practical purposes. A similar study of the ratio of board feet to a 10" top by the Scribner rule gave similar results.

By the use of these curves, tables of board feet per acre were made, for trees 7" D.B.H. and over to a 3" top by the International Rule, and for trees 13" D.B.H. and over to a 10" top by the Scribner rule.

Reconsideration of stand tables developed earlier in the year resulted in averaging the basic data in graphic rather than tabular form. From these data, portions of stands and percentages of trees in various diameter classes may be readily computed.

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#### INTERMOUNTAIN FOREST EXPERIMENT STATION

##### Forest Management

Connaughton began the second year's study of the accumulation and rate of melting of snow under varying conditions of crown and ground cover at McCall, Idaho. The study of five semi-permanent plots was continued under conditions embracing a bare site, sagebrush site, mature ponderosa pine stand with advanced reproduction, mature ponderosa pine stand without advanced reproduction, and a 30-year old reproduction stand. The beginning of melting in 1932 was generally two weeks later than in 1931 and the maximum accumulation of water on the bare site was approximately 80 per cent greater than at the time melting started in 1931. The results of the two years' work point toward the same conclusions in that the greater the degree of crown cover, the greater the dissipation of winter precipitation, and that the beneficial effects of a high crowned forest as a watershed protector are seriously threatened by its large interceptive loss of winter precipitation. However, comparing 1931 and 1932 it appears that a crown cover of a certain density will intercept a fairly constant amount of winter precipitation from year to year regardless of its extent. The total accumulation of water on the heaviest timbered plot in 1931 was 6.35 inches, 3.60 having been intercepted during the winter, while on the same plot in 1932 there was a total accumulation of 13.60 inches of water or 114.2 per cent more than 1931, but with an interception of only 4.03 inches or only a 12 per cent greater dissipation of the snowfall. Crown density as a retarding factor on the rate of melting is proportional to the accumulated snow fall as in 1931 the bare ground plot went bare 10 days ahead of the heaviest timbered plot, while in 1932 this range was 15 days, notwithstanding the fact that the period of melting in each case was 46 days.

Immediately following the snow recession in Boise Basin, a fire damage cruise was inaugurated on the Quartzburg fire of 1931. The basic purpose of a cruise of this 45,000-acre fire in the ponderosa pine type is to show the present damage as determined by a 10 per cent estimate and to supplement this data by permanent sample plots as an inventory of secondary losses occurring following burns of different intensities. Coincident to the cruise data information on type, age class, fuel type, slope, aspect, grazing, etc., is being taken on random plots and definite correlations with character and degree of burn are sought. The burned stand is

being sampled at the time of cruising by the stocked quadrat system recording the stocking before and since the fire on the basis of a normal stand. A study of plant succession on different slopes and exposures as influenced by various climatic factors shall be incorporated in this study and ascertained by means of selected vegetative transects carefully charted and permanently located.

The stand of spring annual weeds on the fire area has been particularly good this year on all south slopes that formerly supported this type of vegetation; north slopes have not furnished a stand of spring vegetation due to either the late season or the fact that at the time of the fire the vegetative cover was not as yet cured by the sun as on the south slopes and thereby probably was exterminated by the intense heat. A good many ponderosa pine seedlings are also being observed on the area even at points of severest burn which occurred in late August and early September of last year. The source of the seed is undetermined.

During the last of May, Connaughton and H. T. Gisborne of the Northern Rocky Mountain Forest & Range Experiment Station visited the western fire forests of Region 4 installing wood cylinders and duff hygrometers for the measurement of fire danger. The use of this type of instrumentation is rapidly growing in favor in Region 4 and is being recognized as a desirable link in the fire protection chain.

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There is one really bright spot in the livestock grazing business according to Dr. Stewart and S. S. Hutchings of the Station. There is a fine growth of forage on the West Desert of Utah in western Beaver and Millard counties. There was at the end of May fully as much forage already produced as at the end of the growing season last fall.

Last fall and winter the stockmen suffered almost at the same time, three terrific jolts. The feed on the winter range was only about half what might be expected in a good season. In the second place, livestock prices were and have continued inordinately low. In the third place, the winter was unusually severe which, combined with short growth, made feeding practically mandatory for most of the outfits depending on winter range. As a result, winter losses were heavy and the lamb crop or calf crop is likely to be low. Naturally, the stockmen are discouraged.

Next winter, however, from the standpoint of forage on the winter range the prospect of good feed is really bright. Not only is growth now as great as for the entire season last year, but the soil is moist two or three or more feet in depth and growth is making further rapid additions.

There is great likelihood of a good seed crop on the major forage plants this summer. This is thought to enhance greatly the value of the growth for winter feed, the seeds behaving in some cases much as a grain crop. Shadscale, for example, bears sharp spines which prevent animals from getting at short twigs. The seed stalks stand well above the spines and animals can browse them effectively. Shadscale is a very widespread



desert species and represents a major forage resource. Practically none of the major forage plants such as white sage, rice grass (sand grass) or black sage seeded last year. There will be a good seed crop on all of these species in Tule Valley, Snake Valley and Pine Valley this year and in the general vicinity of Ibex.

#### Erosion and Streamflow

Chief interest of Craddock and Deming is centering on developing a portable "rain-making machine." This equipment will consist of a portable power pump, two units of sprinkler pipe, a batter of run-off collectors and tipping buckets, as well as rain gauges and a multiple recording instrument. The complete outfit will be hauled on a truck to situations where conditions of cover, slope and soil vary widely, on each of which will be applied different intensities of "rainfall" to determine what influence the variable factors may exert on surficial run-off and erosion.

Materials and equipment have also been ordered for permanent run-off plot installations. Of chief interest in this connection is a special attachment which has been developed for the multiple recording instruments. Rainfall during summer convectional storms within the Intermountain region often may exceed a rate or intensity of 0.07 inch per minute. A roll chart geared to run at a normal speed would not be moving sufficiently fast to record legibly the impulses received from the standard rain gauge tipping buckets or the 0.5 cubic foot run-off tipping buckets during the peak of a storm of cloudburst proportions. Since the peak periods of such storms are the chief cause of high run-off and floods, it is essential that the characteristics of the run-off, as well as of the storm itself, be known. To be assured of a legible record of impulses received from the tipping buckets at all times, each tipping bucket gauge will be connected to a pair of recording pens. The first pen of each pair will record all impulses received; the second, by means of a relay device incorporated within the pen activating mechanism, will record only every tenth impulse received. Although the record of the first pen may become blurred, the record of the second pen should always be legible because of its wider spacing and will assist in the interpolation of the more detailed record made by the first pen of each pair.

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#### NORTHEASTERN FOREST EXPERIMENT STATION

The Northeastern Forest Experiment Station has recently participated in the activities of state committees organized to stabilize and stimulate local forest industries in Connecticut and New Hampshire. These committees are composed of representative timberland owners, sawmill operators, manufacturers and distributors of forest products, farmers, estate owners, and other business men interested in the development of the forest resources.

In Connecticut the committee was organized by the Connecticut Forest and Park Association, and in New Hampshire by the Extension Forester. The Connecticut committee is attempting to stimulate the use of Connecticut woods in Connecticut industries and in particular has attempted to influence the State Highway Department to use wooden fence posts exclusively. It has also considered the formulation of a law which would encourage selective cutting by requiring the piling and burning of slash on extensive clearcutting as a measure of fire protection. The committee hopes to sponsor a detailed social and economic study of a selected area in which the relation of the forest resources to the entire community structure would be analyzed and in which experimental mill set-ups and marketing practices could be tried out.

In New Hampshire the committee proposes to direct major attention toward building up a more extensive market for knotty pine lumber for interior finish, and to working out a plan for a central marketing agency for the products of the individual producers of both hardwoods and softwoods.

Curtailement of the use of hardwood ties other than oak by the principal New England railroads has occupied the attention of the committees in both states. Although current economic conditions are probably responsible for decline in the use of hardwood ties, it has been pointed out that there has been some difficulty in satisfactory use of these ties. Northern hardwood ties, especially beech, check severely during seasoning and the Boston and Maine Railroad claims that surface checking takes place after the treated ties are in the track, opening the way for interior defect. An inspection of ties in the yards of the Century Wood Preserving Company at Nashua, New Hampshire, and of the test tracks of the Boston and Maine Railroad was made by a representative group, including Mr. Wirka of the Forest Products Laboratory. Although there does not seem to be a clear cut case against the northern hardwood ties, it appears that there should be some further study on methods of seasoning these ties prior to treatment and of the technique of treating, with special reference to beech, in order that the service from these local ties may compare favorably with those imported from other regions. The continued use of northern hardwood ties is of tremendous importance to woodland owners and operators in the Northeast because this is about the only utilization for relatively low grade material which constitutes so large a proportion of the second growth or culled stands. The utilization of northern hardwoods stands for lumber and other more valuable products is often made feasible only by concurrent utilization of low grade logs for railroad ties.

A common criticism which we have received of the Cranberry Lake fire weather bulletin is that such a publication is too detailed to appeal to the average forest fire warden and ranger. It has been suggested that future reports on our fire-weather work be issued in two separate publications, a comprehensive technical publication and a non-technical report for the field men. In line with this suggestion, Stickel has completed a non-technical summary of the Petersham fire weather study. It contains the basic information, in the form of alignment charts, with which field men can determine for themselves duff moisture content and degrees of hazard



as well as suggestions of how such information, when used in conjunction with daily weather forecasts, can be used to estimate future hazard. We have been fortunate in interesting the Massachusetts Forestry Association to undertake the publication of this report. If the Association is able to do this the bulletin will appear early this summer.

Jensen completed the grouping of the data collected on 273 permanent cruise plots established during the past field season on 1,400 acres of the Bartlett Experimental Forest. Stand tables, segregated by types and age classes, were prepared for all sound trees down to a minimum diameter limit of two inches. Volume computation for the stand, which is composed of 5 conifers, 12 merchantable, and 14 weed hardwood species, will be completed during the summer. Reproduction tallies based upon about 4 per cent of each plot were also summarized. These summaries showed that the nucleus of a good stand is present on practically the entire area. The older cut over areas contain a considerable number of wolf trees, while some of the more recent cuttings support a heavy stand of red maple growth, the bulk of which are of sprout origin.

Scotch pine transplants grown by the New York Conservation Commission from seed of desirable stock found at Booneville, New York, have been planted at ten different locations in New England and four in New York, through the cooperation of the various state forestry departments and other agencies. Through these plantings a definite measure will be obtained of the adaptability of this desirable strain of Scotch pine to a wide variety of conditions in the Northeast. Individual plantings cover about one acre each and will be extended to three acres each by additional plantings in the next two years.

Doctor Stewart has studied planting operations on a number of jobs being carried out by the different states in the region. Staked rows of 100 trees each have been established on each job visited in order to study the relation of the way the trees have been set to survival and subsequent root development. Detailed examination of the individual trees indicates that there is a surprising range in the number of trees which appear to be improperly set. There is a general tendency to set trees too deeply and it may be that subsequent growth is more profoundly affected by the planting itself than has been previously supposed.

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NORTHERN ROCKY MTN. FOREST AND RANGE  
EXPERIMENT STATION

Silviculture

Director Watts and Mr. Weidman of the Station, with Messrs. Koch of Management, Strong and Joy of Blister Rust Control, and Rettig of the Clearwater Timber Company, examined the Canadian blister rust devastations.

The party, in traveling three hundred miles north from Nelson toward Revelstoke, found blister rust at every place where they looked for it.

They concluded that the rust if left uncontrolled in Region One would spread rapidly, but with the present level of appropriations for control there is a reasonable probability of being able to keep ahead of it on National Forest lands.

Fire

In cooperation with the Office of Operation, instructions for mapping seen areas from potential detection points have been sent to the Forests. Within a few weeks the Forests will also receive further data developed from the fire statistical analysis and the studies of man-power placement in relation to transportation and other facilities.

Products - Economic Survey

The ponderosa pine volume table made for the Forest Survey was revised during the month. Because the basic data contained an insufficient number of trees in those diameter classes 38 inches and over, the volumes for those diameters were computed by Girard's rule of thumb. These computations checked, within one per cent, the actual tree volumes of the basic data used for the table.

Products - Census

Progress on the Idaho-Montana canvass resulted in the job's being about 90 per cent completed on May 31. The returns from nearly 400 establishments were prepared for transmittal to Washington. Clean-up work has been started with a view to clearing the entire mailing list during the coming month.

Logging and Milling

Preliminary field work for the proposed ponderosa pine selective logging study on the holdings of the Anaconda Copper Mining Company was inaugurated. Three plots of about ten acres each were selected at a point about three quarters of a mile from the main highway in the Black-foot Valley near Greenough, Montana. The accessible nature of the plots will facilitate their use as demonstration areas in the future for both the Forest Service and the University of Montana. Final selection of



the study plots was made by Anderson and Weidman of the Station; Neff of the Regional Office of Management; Rutledge Parker, State Forester of Montana; Professor Clark of the University of Montana; Don McKenzie of the Anaconda Copper Mining Company; and Fred Mason of the Polleys Lumber Company.

Anderson also spent some time at Coeur d'Alene and Spokane making preliminary arrangements for the woods and mill study proposed in the western white pine type on the holdings of the Ohio Match Company. The primary object of this study is to secure logging-cost data by tree and log sizes for use by the Regional Office of Management in revision of appraisal and utilization practices. However, if the necessary funds and personnel can be recruited the study will be carried through the sawmill at Huetter and the match-block plant at Spokane in order to determine the effect of aspect, altitude, composition of stand, and age of timber upon the yield of match blocks.

#### Average Mill Run Prices

|                  | Annual<br>1930 | Annual<br>1931 | First<br>Quarter<br>1932 | April<br>1932 |
|------------------|----------------|----------------|--------------------------|---------------|
| Idaho White Pine | 33.56          | 27.56          | 23.57                    | 24.00         |
| Ponderosa Pine   | 21.64          | 18.24          | 15.92                    | 16.10         |
| Larch-Fir        | 17.32          | 13.26          | 10.87                    | 9.44          |
| White Fir        | 16.34          | 11.00          | 8.43                     | 8.25          |
| Spruce           | 21.93          | 16.51          | 13.97                    | 15.96         |

#### Shipment and Cut

|          | Month of April, 1932<br>1932 | 1931    |
|----------|------------------------------|---------|
| Shipment | 126,374                      | 187,313 |
| Cut      | 90,060                       | 188,420 |

#### Range

The second of two wells that are keys to the carrying capacity and utilization study planned at Miles City was completed and tested May 29. Each well has been pumped for four hours or more without diminution of the approximately four-gallon-per-minute supply.

All material except half the posts needed for approximately 16 miles of fencing is on the ground, and about 20% of the fencing work is completed. A crew is pushing the fencing.

Rainfall at Miles City in April made a record with about  $3\frac{1}{2}$  inches, but less than half the 2.62-inch normal for May was received. However, the range forage of the short-grass country has been making a splendid growth. Hurtt says his "hat is off" to the comeback staged by the native grasses after three years of drought, the last year of which was the driest

recorded in 60 years. On the U. S. Range Livestock Experiment Station, which for the most part has been conservatively stocked, comparatively little dead sagebrush or grasses are found. A substantial percentage of important wheat and grama grasses have been replaced on heavily overgrazed ranges by annuals. Everything considered, however, the resistance of the short-grass forage to adverse conditions is astonishing. Even though no more rain is received in 1932, more forage will be produced than in either 1931 or 1930. Even the dry-farmers are encouraged. However, 50 days of favorable weather are still needed before a dryland crop is "out of the woods." Therein lies the secret of the greater gamble on dryland crops as contrasted to range under conditions in the short-grass country.

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## PACIFIC NORTHWEST FOREST EXPERIMENT STATION

### General

After a canvass of the office buildings of the city, the Director has negotiated for a renewal of our lease in the Lewis Building at a considerably reduced rental. It appears that space in the new Federal Building will be ready for us about June 1 next.

A photograph album for the use of callers has just been prepared in which one or two pages are devoted to each of the Station's projects. On each page there will be two to five informative photographs and occasionally graphs and maps, each appropriately labeled.

### Section of Forest Products

Requirements Phase of Survey - During the month the 1931 building permits for Portland have been analyzed, and some 50 one-family dwellings constructed last year have been visited. Bills of materials for twelve houses are partially summarized as to the lumber used in construction. Contacts have been made with contractors, builders, and mill-work manufacturers in order to answer questions which have arisen. As soon as conversion factors for the various price classes can be completed and tested, the work should progress much more rapidly.

Douglas Fir Mill Scale Study - Three working days have been spent in the mill of the Southeast Portland Lumber Company. A crew of seven men, including two West Coast Association graders has been ample to handle this mill, which has a capacity of 100,000 feet per eight-hour shift. Production is now curtailed even below the two-day-a-week schedule upon which the company has been working. Consequently it has been decided to begin work at Cottage Grove, Oregon early in June, and at Vaughn, Oregon, the latter part of the month. The study in Portland can be completed later if conditions allow.



Logs, Lumber, and Other Timber Products Census - Johnson spent about half the month on the 1931 census. To date 1,584 schedules have been forwarded to Washington.

Forest Survey - Johnson spent several days doing some preliminary work on the cutting depletion phase of the forest survey to determine ways and means of approaching the study.

#### Selective Logging in Douglas Fir

The completion of Part I of a proposed series of three reports on the selective logging project was held up during the latter part of the month due to the decision to insert further discussion on several phases of cost appraisal methods.

Word has been received from the management of the Crown Willamette Paper Company that, beginning about the middle of June, they will commence logging with two caterpillar tractors equipped with arches, their plan being to gradually feel their way toward methods of logging that will allow the most intensive type of economic selection. Their timber holdings are to a large extent characterized by a scattering of larger sized veteran Douglas fir trees with a substory of western hemlock--a situation that is very favorable to direct tree selection.

#### New Public Domain

Wilson, with three assistants, has spent practically the entire month in the county offices of Columbia and Clatsop Counties, Oregon. The office work on both counties has about been concluded and shows an astonishing situation which is a very real forest ownership and land use problem. The two counties offer interesting contrasts in the trends of delinquency and land abandonment. It is the expectation to make the office survey of land status in as many counties as possible in rapid succession and then return for field work and more specialized study of sample areas at a later date.

#### Forest Survey

Replies to a questionnaire asking all east side supervisors for suggestions as to the conduct of the survey in the pine region were received and tabulated. Many excellent suggestions relative to types and technics were received. The Director, members of the survey staff and of the Regional Offices of Management and Grazing went over these replies at a joint meeting and tentative decisions as to methods of typing on the east side were made. Following this meeting, Munger and Andrews spent five days visiting five east side Oregon forests, and went over the various points raised in the questionnaires with the supervisors and their technical assistants. Types, methods of work, sources of data, personnel, and other items were gone over in the various offices while types and the application of the stocked quadrat method were investigated in the field.

During May Buell finished type mapping Thurston County, Washington, and Briegleb finished Hood River County, Oregon. Adjustment cruising was completed in Lane and Clackamas Counties, Oregon by Wakeman and his party, and Pierce County, Washington by Pratt and his party.

The status of the inventory phase of the survey at the end of May is as follows:

#### National Forests

Field work has been completed on nine out of twelve west side forests, with work still in progress on the remaining three. Field work has been completed on about 90 per cent of the total national forest area in the Douglas fir region.

Office work - Completed on five national forests and in varying stages of completion on the remaining seven. About 80 per cent of the total office work on the Douglas fir national forests has been completed.

Check cruising on national forests - The checking of sample compartments on the various west side national forests is about 30 per cent done.

#### Lands Other than National Forest

Mapping in place is finished in 23 counties, is in progress in six, and field work has yet to be started on nine counties. About 65 per cent of the area to be mapped has been covered.

Adjustment cruising has been completed in 22 counties, is in progress in four counties, leaving 12 counties yet to be started. However, in five of these twelve counties there is but little adjustment cruising to be done, and about 70 per cent of the adjustment cruising for the region is completed.

The office work including final recapitulations for the lands other than national forest is about 10 per cent done.

#### Fire Studies

A good start was made on the fire depletion phase of fire damage studies. Matthews has reviewed the records for fires 100 acres and larger for all western Oregon forests. He finds that area apparently is considerably overestimated in most instances, and that a field check probably must be made before damage figures as recorded on the fire reports can be accepted.

McArdle served on the examining committee for the two students at Reed College who have been working on problems he suggested. One of these students, whose thesis was on "Measuring the Transparency of the Lower Atmosphere", has devised a method for using the photo-electric cell to



rate visibility. The other student has developed a stabilized oscilloscope for visual recording of static wave forms and an instrument for automatically recording the general static level simultaneously with measurements of the relative conductivity of the air. These devices will be used this summer by Professor O'Day in his continuation of the static-lightning storm study.

Six forests are cooperating with the Station in a practical test of the "wood cylinder" method of measuring fuel inflammability. A method has been developed to simplify the method; instead of converting weight to moisture percentage, the moisture percentages are obtained directly by weighing with "slugs" equal to 1 per cent moisture.

McArdle suggested that instead of dynamite to recall road and trail crews to the telephone for fire emergencies, that ordinary aerial signal bombs be used. A test was made and the bombs can be heard clearly at 5 miles. The Regional Office is supplying the forests with these bombs for use during the summer.

A method for graphically recording summer rainfall on the national forests was developed. Small colored tags are hung on a map at each precipitation station, the different colors representing various classes for amount of precipitation.

#### Mensuration

Meyer, assisted by Kolbe and Morris, remeasured ten sample plots in even-aged Douglas fir. Although several bad seasons for damage had just been experienced, the plots fortunately sustained no major depletion. A heavy wind storm of two years ago and considerable snowbreak of the past winter made a mess of the open portions of the stands in which some of the plots are located, but did not have much effect in the normally stocked stands.

Two computers have been helping Meyer most of the month on the ponderosa pine growth study; it has arrived at the stage when all materials are being assembled and whipped into form for a manuscript.

#### Wind River Branch Station

On May 1 Isaac opened the Wind River field station for the season, and Norman Hawley was assigned there as field assistant. There are fifteen projects being conducted at or in the vicinity of this branch either on or off the proposed experimental forest, upon which various members of the Station staff spend time during the field season.

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## SOUTHERN FOREST EXPERIMENT STATION

### Naval Stores

The year-long drought in north Florida was apparently broken during May, when precipitation exceeded normal by 1.22 inches. For the 12 months ending May 31st, 1932, the accumulated precipitation deficiency equalled 18.20 inches from a normal total of 50.25 inches. It is estimated that the combined effects of drought, forest fires, and subsequent insect attacks have killed 10 per cent of the large saw-timber within a radius of 25 miles from the Starke Branch Station. Turpentine timber has been so injured that not more than 50 per cent as much is being worked now as a year ago.

A study of the root system of a 12 inch longleaf pine at Kingsley Lake, in Blanton soil, showed that the tap root extended to the water table through 8 ft. of semi-hardpan. The longest lateral extended 85 ft. in a straight line from the stump.

### Soils Map of Olustee Forest

A soils map of the Olustee Experimental Forest was completed with the cooperation of the Bureau of Chemistry and Soils. Seven soil types and one miscellaneous soil (Muck) were recognized. The three commonest types, making up 81.7 per cent of the area, are Leon fine sand without hardpan, 36.7 per cent; Plummer fine sand, 23.8 per cent; Leon fine sand with hardpan, 21.2 per cent. Plant indicators for the various types were determined, so far as possible.

### Forest Survey

The month of May found three three-man crews working in the northern portion of the Delta in Mississippi. By the end of the month over a third of the Mississippi Bottomland area north of Vicksburg had been surveyed.

All of the office compilations for the 2,176,000 acres in the Upland Hardwood Region have been completed, except the entering of the stocking data. As soon as these are entered, the compilation sheets will be ready for punch-carding and Hollerith runs can be made.

Tallying of total heights of hardwood trees of merchantable size has been discontinued, because total heights cannot be used directly for volume computations, and because it is difficult to determine accurately the total height of the irregularly-topped bottomland hardwoods.

One stand of virgin red gum was found estimated to contain 40,000 B.F. Scribner Decimal C. per acre. One tree measured 32 inches D.B.H., total height 164 ft., merchantable height to a 20 inch top, 48 ft. Stands of cypress scaling 35,000 B.F. per acre were also found. Considerable mortality, resulting from recent deposition of silt, was found in stands of oak, gum, ash, elm, and hackberry. Cottonwood, willow, and box-elder withstood this silting, probably because of their ability to put out adventitious roots.



Winters continued his study of determination and recording of stand mortality for the hardwoods.

### Financial Aspects

Field work on the first "case-study" of specific forest properties under the Financial Aspects of Private Forestry project was completed. This case-study was conducted in the Shortleaf-Loblolly-Hardwood type in southeastern Arkansas, on a holding of several thousand acres of lightly culled timber, now well stocked with merchantable trees and reproduction. The timber is being cut on a sustained yield basis to a 17 inch diameter limit by a small mill producing small dimension stock, boards, and box material.

On adjoining areas another company has cut to a 12-13 inch diameter limit, and has made its stand and growth data available to the Station. An excellent opportunity is here afforded for comparisons between these two systems as to costs of growing timber and returns thereon. Data were also collected on cost of logging by trucks, and milling by a small circular mill, to be contrasted with costs of railroad logging and band milling to be collected in other case-studies.

### New Public Domain

Field work on the New Public Domain project was inaugurated the last part of April in Drew County, Arkansas, and was completed May 31st, 1932. The primary purpose of this month's work was to perfect field procedure and technique in order to insure collection of pertinent data in succeeding county studies. This county, with the least tax-delinquency of any in Arkansas (0.6%), was selected for this purpose in order to provide a quick try-out of methods. This has been accomplished and the necessary changes made in the Working Plan. Field work will be resumed, in cooperation with the University of Arkansas, in southwestern Arkansas in July.

### Methods of Germination Tests

Wakeley reports completion of the main germination tests of the year, a 50-day run, and computation of the time required for tests made with the standard sand flat and those made with the new peat mat. Nine representative samples were tested on each medium, 250 seeds per test. The peat mats gave slightly higher and much more rapid germination and required only 85 per cent of the time needed to set-up, maintain, and take down the sand flat tests. In addition, the peat mats require far less space in the laboratory. These peat mats are  $7\frac{1}{2}$  inches square and  $\frac{3}{4}$  inch thick, molded from florists' peat (pH about 4.3), with a reinforced rim of wire and with 10 grooves in the top for 10 sub-lots of 25 seeds each. Each mat is placed in a shallow square glass baking dish covered with a pane of window glass. Water is poured into the side of the dish as needed.

## Forest Products Pathology

Three preliminary timber dipping tests on pine and hardwood were established in Mississippi by Chapman. In these tests several entirely new compounds were included, as well as others which have been greatly refined.

Experiments were begun at Natchez, Miss., on treatments for stacking stickers to prevent decay in piled lumber. Two compounds, very effective in stain control, were used in both oil and water solutions and the treated stickers were placed under conditions favorable to decay development.

## Forest Pathology

Siggers reports receiving for examination a specimen of leaf blight on Austrian pine from Ohio. The causal fungus appears to be closely related to the one causing longleaf pine needle blight in the South. The material is being worked on in the laboratory to obtain germination.

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## RESEARCH ACTIVITIES IN R-2

Engelmann spruce growth and yield:- Supervisor Pearce continued until May 1 with his task of revising the individual Forest reports and coordinating the data in the administrative strip survey growth study for the spruce type. In order to complete the preliminary work so that the summarization of results may be undertaken in the fall, Ranger Burton was assigned to assist Supervisor Pearce during April. The revised graphs and computations are now awaiting final check, which will be undertaken by Roeser probably toward the end of June.

The last few days of the office season were used by Roeser in summarizing the growth data for the Rio Grande and Uncompahgre management study plots, the only remaining ones for which no reports have as yet been submitted. Preparation of report for these two projects will be undertaken when an opportune time presents itself during the present field season.

Ponderosa pine source of seed experiment:- On April 11, Junior Foresters Lепley and Averill moved up to the Fremont Station with Roeser and until the time of their transfer to their summer administrative assignments on May 11, were engaged in planting the 2-2 Monument Nursery stock which constituted the comprehensive 1928 series in the individual variation phase of the Pinus ponderosa seed source study. A total of 3330 trees were planted in four new plantations, three at Fremont and one at the Monument Nursery, as follows:



A plantation of 718 trees at Fremont, (9100' elevation) to study the comparative development of stock from parent trees growing at different elevations within the same latitude. Eight lots are included in this test.

A similar plantation at the Monument Nursery (7200' elevation) to provide a comparison of growth at the lower limit of the natural range of ponderosa pine.

A plantation of 1150 trees, representing 10 lots of progeny from local trees, identified both as mistletoe resistant and mistletoe susceptible, to test the practical possibility of improving the local strain of ponderosa pine and developing mistletoe resistance.

A small plantation of 280 trees including only progeny derived by artificial crossing among a few selected local trees of an apparently superior strain, to constitute the first step in an attempt to develop a pure strain of ponderosa pine.

Sample trees of each lot were set aside for individual analysis. In addition to that for the Fremont project, sample analysis material was received from the Bessey Nursery, representing the 1929 and 1930 series in the Nebraska plantations seed source study. The task of studying these representative samples in the Fremont laboratory occupied much of Roeser's time after the planting had been accomplished, and was still under way on June 1. While no quantitative comparison is at present available, the results seem to indicate that variation in dry weight between individual offspring of the same parent is of sufficient magnitude to obscure, largely, any specific differences which may be attributed to distinct lines of heritage; also that age and vigor of parent tree are of more significance from the standpoint of rapid early development of progeny than differences in geographical distribution.

Type study:- The meteorological equipment which provides the climatological basis for this study was placed out in the field at the fourteen Fremont ground stations on May 1. Daily observations, which had been made all winter of one-foot soil temperature, air temperature, evaporation and snow depth, were augmented to include surface soil temperature and soil moisture determinations, the latter at weekly intervals.

The soil this spring has been much drier than usual, as the result of the prolonged drouth, dating back to midsummer, 1931. During the past ten months, the number of storms of appreciable magnitude (bringing 1" or more of moisture) which have occurred along the Front Range of Colorado in the Pikes Peak region has been very small. Winter precipitation was quite deficient. The precipitation deficiency since the end of the 1931 growing season is 32%. The spring moisture of April and May, amounting to 3.37" was only 70% of normal. Fortunately, this spring moisture has been very uniformly distributed in weekly storms, which fact has helped to compensate the relatively small volume of precipitated moisture. The continued drouth, (the year 1931 was 13% drier than normal), which has apparently been confined exclusively to the Front Range of Colorado on

the Pike Forest, has reduced the water storage in the municipal reservoirs of Denver and Colorado Springs to an alarmingly low level.

Douglas fir seed production:- On April 13, the first examination was made of the twenty-five local (Fremont) trees, whose flower and cone crops are made the subject of detailed study in order to determine the influence of climatic conditions upon flower setting and upon the relation between flower production and cone production. At this time four of the trees at the 7000 foot level were already in flower. For the third successive season, ample evidence was provided of the intimate relationship between freezing weather on the one hand and flower mortality and size of cone crop on the other, when a cold snap about May 1 decimated the early crop of flowers to the extent that the ultimate cone crop will, in most cases, be a very small percentage of the possible crop. In the case of three of the four trees, the final crop will represent less than 2% of the possible crop. At higher elevations, above approximately 7500', the losses have been much smaller because of the absence of late spring frosts and later opening of the flower buds, but all of the trees experienced some mortality in the flower crop. Incidentally, the 1932 local Douglas fir crop is the heaviest since the study was started in 1922.

The most recent results of sample plot studies, brief mention of which was made in the report of last September, indicated that diameter growth and to a less pronounced extent, height growth, are directly proportionate to the distance between residual trees in the thinned stands. Because of the very porous nature of the soil, the conservation of the limited water supply is of utmost importance and this can best be accomplished by thinning heavily and leaving a widely spaced stand of about 700 trees per acre at the age of 10 to 12 years.

Mr. G. A. Pearson, Director of the Southwestern Forest and Range Experiment Station, was a Regional visitor during the latter half of May. The purpose of his visit was to obtain first-hand knowledge of the character of the stands of ponderosa pine and associated species in the Black Hills and Rockies proper and their growth and reproductive capacities. After visiting the Black Hills, Mr. Pearson stopped at Colorado Springs and spent a week in the company of Regional Forester Peck, Assistant Regional Forester Thompson (who also accompanied him on the rest of his trip), Supervisor Keithley of the Pike Forest, and Roeser. On the Pike Forest he was shown various cut-over areas in order to study the progress of natural reproduction in the ponderosa pine and Douglas fir types and also areas where the erosion problem on important municipal watersheds was serious. The Salt Creek and South Platte erosion study plots, in which the Experiment Station has been actively interested, were visited. Although lack of funds prevents the intensive development which it is desired to undertake on the Salt Creek area, the results obtained by the fencing, in 1931, of specific study areas against grazing are already apparent. The present plan contemplates the development of a comprehensive photographic record obtained at a large number of permanent camera points on all six plots included in the experiment. In its present status the foundation has been laid upon which to build at a later date in case the opportunity presents



itself to expand the scope of experimental objectives by the inclusion of vegetative quadrats, erosion profiles, etc., which will add to the scientific value of this particular experiment.

The question of procuring natural ponderosa pine reproduction on cut-over areas in the Central Rockies is more or less a problem. On most areas logged relatively recently, few seedlings are to be found. The presence, however, of heavily stocked sapling stands from 20-60 years ago, which are common throughout the interior of the Pike Forest on old burns and on sites which were badly slashed in pre-Forest days, indicates that reproduction does come in when the conditions are right. The results of reproduction studies in this region indicate that successful establishment depends upon the fortuitous occurrence of a heavy seed crop, which may only be expected at four to five year intervals, followed by one or two droughtless seasons. This combination occurs very infrequently. It is possible that a heavier cutting than is normally practiced may result in a more promptly established and a more satisfactory stand of reproduction, provided that enough old trees are left to provide an adequate supply of seed.

Cut-over Douglas fir, and, to a lesser extent, spruce stands present no reproduction problems. There is normally enough advance reproduction present in the case of the latter species to insure satisfactory replacement. Douglas fir, as a rule, regenerates itself freely after cutting. Ample proof of this is provided by the Douglas fir cutting methods study plots at Fremont, where a reproduction stand, averaging about 5,000 new trees per acre, has established itself since 1915 following both a selection and a shelterwood form of silvicultural treatment. Competition with the reserve stand for the limited supply of soil moisture in the spring and fall during the critical first two years of seedling existence determines largely the density and degree of development of the reproduction, provided enough trees are left (50 in the case of the above mentioned shelterwood which gave the best results) to provide an ample seed supply. Mr. Pearson was very much impressed with the results obtained in this experiment.

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